Horizon Europe project factsheet:

How to minimize the ecological footprint for functional electronics?

ECOTRON

Project ambition:

The widespread use of electronics in everyday objects, such as consumer electronics, healthcare, wearable electronics, IoT and smart packaging, is creating an ever-growing burden on the environment due to its quantities but also specifics, such as the use of PCBs (printed circuit boards) which are challenging to recycle. The main objective of ECOTRON is to reduce this negative impact by developing **sustainable functional electronics**. This will be achieved by developing **new disruptive technologies, materials and designs** which will allow **easier/better dismantling** of individual components, improve **recyclability**, and introduce the **use of bio-based/compostable materials in printed electronics (PE)**.

Project description:

ECOTRON will advance low TRL technologies on materials development, print and recycling processes to **TRL 4/5**.

Diverse portfolio of ECOTRON technologies, processes and materials includes **reversible interconnects** (i.e. Diels-alder, Gecko tape), **separation technologies** (i.e. photonic, sacrifice layer), **recycling of substrate** (solvolysis, chemical recycling) and **metal recovery** (supercritical fluid extraction, solvometallurgy), and **biobased and/or compostable substrates and inks**.

These will be **integrated and validated in four high-impact use cases** by integrating "greener" options in each iteration/generation (Figure 1). Every use case will go through 3 iterations, with improved sustainability in each generation.

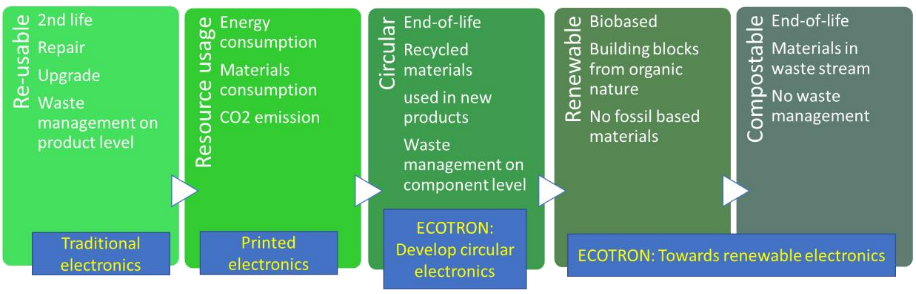

Figure 1*: "Shades of green" approach, various levels of sustainability*

These technologies will cover different aspects of electronics. More specifically, ECOTRON will allow r*euse of electronic waste at the product level* (not only at the level of PCBs). It will also *reduce the use of resources* (e.g. decrease of required energy and materials, and thus also the environmental footprint). New *bio-based and compostable materials* will be developed and used. Additionally, the circularity aspects will be integrated into the designs which will improve the dismantling possibilities.

Project facts

Start date
01/09/2022

End date
31/08/2026

Duration in months
48

Project budget
€ 5M

HE Research and Innovation Action (RIA)

Grant Agreement
101070167

Call
HORIZON-CL4-2021-DIGITAL-EMERGING-01

Topic
HORIZON-CL4-2021-DIGITAL-EMERGING-01-31
Functional electronics for green and circular economy

Keywords
Functional / sustainable / bio-based / recyclable printed electronics
Blueprint for electronics recycling plant

The four use cases cover a broad range of applications (Figure 2):

1. On-body subcutaneous drug delivery system (BD)
2. Printed electronics light panel (Signify)
3. Wearable activity tracking device (POLAR)
4. Electronics for smart packaging (Janssen)

Disclaimer: *BD Libertas™ Wearable Injector is a product in development; some statements are forward looking and are subject to a variety of risks and uncertainties. BD Libertas™ Wearable Injector is a device component intended for drug-device combination products and not subject to FDA 510(k) clearance or separate EU CE mark certification.*

***Figure 2**: The four ECOTRON use cases*

Finally, since the recycling regulations for printed electronics are currently either not clear or non-existing, ECOTRON will develop a **blueprint for a future industrial scale, self-contained recycling plant**.

Expected impact:

ECOTRON will develop novel, flexible and organic PE (FOPE) technologies and designs which will:

- Decrease the use of precious metals
  - >90% silver ink recollection via recycling through mechanical and chemical processes;
  - Gradual replacement of metal inks (Cu / Ag based) with newly-developed organic inks and interconnects;
- Create less waste disposal due to development of:
  - Reversable interconnects (>99% recollection of discrete components);
  - Chemical recycling (>90% recovery of polymer substrates);
  - Fully recyclable electronics' products (circular, renewable), in final stage compostable with no valuable materials left;
  - Reduce the environmental footprint through the creation of renewable (& compostable) substrates from bio-monomers;
  - Reverse offset printing which will miniaturise electronic circuitry. This leads to > 80% less conductive material use, >50% less energy use and >70% less CO_2 emissions;
- Create viable circular business models for printed electronics via the use of toxic free inks (for low-conductive applications);
- Prove, through the recycling process blueprint, up to 95% of the used materials in flexible electronics can be re-used and up to 90% of the materials can be recycled, which will in turn provide the resources for new FOPE products, creating a powerful business case through minimising waste streams and decrease dependence on raw materials (metals, substrates).

Consortium

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